



Course Specification

Course Name:Algorithms

Course Code:[CS316]

I. Basic Course Information

Major or minor element of program:[General]

Department offering the course:[Computer Science Department]

Academic level:[300 levels]

Semester in which course is offered:[Second (spring) semester]

Course pre-requisite(s): CS 112 Programming – 1

Credit Hours:3

Contact Hours Through:

Lecture	Tutorial*	Practical*	Total
2.5	0.0	1.5	4.0

* 1.5 hours for **either** Tutorial or Practical

Approval date of course specification: January 2015

II. Overall Aims of Course

[The purpose of this course is to provide the students with solid foundations in the basic algorithms. The main objective of the course is to teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter. This course is also about showing the correctness of algorithms and studying their computational analysis and complexities. This course offers the students a mixture of theoretical knowledge and practical experience.]

III. Program ILOs covered by course

Program Intended Learning Outcomes (By Code)			
Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
[K1,K4,K12]	[I1,I5]	[P2,P3]	[G1,G2,G8]



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IV. Intended Learning Outcomes of Course (ILOs)

a. Knowledge and Understanding

On completing the course, students should be able to:

- K.1 Describe the fundamental ideas used in algorithm analysis.
- K.2 Define standard strategies or frameworks to solve computational problems, including Divide-and-Conquer, dynamic programming.
- K.3 Apply proof ideas to related problems.
- K.4 Explain the basic concepts of graph theory.

b. Intellectual/Cognitive Skills

On completing the course, students should be able to:

- I.1 State computational problems, to identify/establish their time complexity, understand the complexity classes P and NP.
- I.2 Identify a problem and analyse it in terms of its significant parts and the information needed to solve it.
- I.3 Evaluate and formulate possible solutions to problems, and select and defend the chosen solutions.

c. Practical/Professional Skills

On completing the course, students should be able to:

- P.1 Develop recursive algorithms as they apply to trees and graphs.
- P.2 Understand different programming design methods.
- P.3 Exercise creativity in designing efficient algorithms.

d. General and Transferable Skills

On completing the course, students should be able to:

- G.1 Demonstrate ability to work as a team member.
- G.2 Manage one's own learning and development, and demonstrate the ability to use a variety of learning resources and acquire information.
- G.3 Demonstrate an appreciation and ability to continue professional development and ensure life-long self-learning. Practice working in Teams through group projects.
- G.4 Apply time-management skills.

V. Course Matrix Contents

	Main Topics / Chapters	Duration (Weeks)	Course ILOs Covered by Topic (By ILO Code)			
			K & U	I.S.	P.S.	G.S.
1-	Algorithm analysis	2	K1	I1	All	All
2-	Algorithm design	3	K2	I2,I3	All	All
3-	Dynamic programming	2	K2,K3	I2,I3	All	All
4-	Graph theory	3	K3,K4	I2,I3	All	All
5-	P and NP problem classes	3	K1,K3	I2,I3	All	All
	Net Teaching Weeks	13				



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VI. Course Weekly Detailed Topics / hours / ILOs

Week No.	Sub-Topics	Total Hours	Contact Hours	
			Theoretical Hours	Practical Hours*
1	Algorithms, Efficiency, Analysis, Order	2.5	2.5	
2	Divide and conquer	4	2.5	1.5
3	Backtracking	4	2.5	1.5
4	The Greedy Approach	4	2.5	1.5
5	Branch-and-Bound	4	2.5	1.5
6	Dynamic Programming-part-1	4	2.5	1.5
7	Midterm Exam			
8	Dynamic Programming-part-2	4	2.5	1.5
9	Graphs-1 (max The Greedy Approach, min cut, max matching, min node cut)	4	2.5	1.5
10	Graphs-2(bellman ford, dijkstra, floyd warshall, Minimal Spanning Trees, flood fill, Eulerian Tours)	4	2.5	1.5
11	Computational Complexity	4	2.5	1.5
12	Number-Theoretic Algorithms	4	2.5	1.5
13	Geometric Algorithms	4	2.5	1.5
14	Revision	4	2.5	1.5
15	Final Exam			
Total Teaching Hours		51	33	18

* No Practical/Tutorial during the first week of the semester

VII. Teaching and Learning Methods

Teaching/Learning Method	Selected Method	Course ILOs Covered by Method (By ILO Code)			
		K & U	Intellectual Skills	Professional Skills	General Skills
Lectures & Seminars	*	All	I1,I2		
Tutorials	*	All	I2,I3	All	
Computer lab Sessions	*	All			G1,G2,G3
Practical lab Work	*	All		All	G4
Reading Materials	*	All	I1,I2		
Web-site Searches	*	All	I1,I2		
Research & Reporting					
Problem Solving / Problem-based Learning	[*]		All	All	
Projects				All	
Independent Work	*			All	G1,G2,G3
Group Work	*			All	All
Case Studies					
Presentations					
Simulation Analysis					
Others (Specify):					



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VIII. Assessment Methods, Schedule and Grade Distribution

Assessment Method	Selected Method	Course ILOs Covered by Method (By ILO Code)				Assessment Weight / Percentage	Week No.
		K & U	I.S.	P.S.	G.S.		
Midterm Exam	[*]	[K1,K2,K3]	[All]	[]	[]	[10%]	7
Final Exam	[*]	[All]	[All]	[]	[]	60%	15
Quizzes	[*]	[All]	[All]	[]	[]	[]	[2,4,6,8,11,13]
Course Work	[]	[]	[]	[]	[]	[]	[]
Report Writing	[]	[]	[]	[]	[]	[]	[]
Case Study Analysis	[]	[]	[]	[]	[]	[]	[]
Oral Presentations	[]	[]	[]	[]	[]	[]	[]
Practical	[*]	[]	[]	[All]	[All]	[10%]	[3,5,10,14]
Group Project	[]	[]	[]	[]	[]	[]	[]
Individual Project	[]	[]	[]	[]	[]	[]	[]
Others (Specify):	[Take home Exam]	[]	[]	[All]	[All]	[10%]	[9]

IX. List of References

Essential Text Books	<ul style="list-style-type: none"> [Foundations of Algorithms Using C++ Pseudocode by Richard Neapolitan and Kumarss Naimipour ISBN:0763723878]
Course notes	<ul style="list-style-type: none"> [Handed out to the students part by part]
Recommended books	<ul style="list-style-type: none"> [Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. ISBN 0-262-03293-7]
Periodicals, Web sites, etc ...	<ul style="list-style-type: none"> [None]

X. Facilities required for teaching and learning

<ul style="list-style-type: none"> [Labs prepared with C++, Java and C# IDEs]

Course coordinator:Dr.Sherif Khattab

Head of Department:Prof. Abeer El Korany

Date:January 2015